BE.011/2.772J
Statistical Thermodynamics of Biomolecular Systems
Spring 2004
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Problem Set #1
Due: 2/11/04

7.) You have 4 boxes and 3 different (i.e., distinguishable) balls, which are Red, Yellow, and Blue.

a) If there is no restriction on the number of balls per box, how many different ways can the balls be put in the boxes?

b) If we impose a restriction that the first box must contain 2 balls, and the second box must contain 1 ball, how many ways can this be achieved? First, write out all the possibilities. Then, write out the general formula you would use to calculate it, and see if it matches.

c) What is the probability that the situation in b) (2 balls in box 1, 1 in box 2) was achieved if the balls were thrown in randomly, as in a)?

8.) You have a genome that is exactly $1 \; ? \; 10^9$ bases long. You would like to choose a DNA sequence out of the genome that is unique. What is the minimum length of the sequence such that it could be unique (i.e., it is possible that it does not occur anywhere else in the genome)?